Quantile Regression: Theory and Applications
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Readership: Researchers and practitioners in different fields including statistics, economics, and social and environmental sciences.

Contrary to conventional methods of least squares, which approximate the conditional mean of the dependent variable given a set of explanatory variables, quantile regression aims at fitting a relation between percentiles of the dependent variable and the explanatory variables. In their introduction, the authors state as the goal of this book to be a 'practical guide to quantile regression'. It therefore 'concentrates on concepts rather than mathematical details' and 'applications using real data' (xvii). This is of course ambitious for a book on statistical methodology, but I hope to make the case in this review that the authors keep their promise.

The structure of the book is straightforward. The first chapter sets off by outlining the basics of quantile regression, starting from the difference between the mean and the median. Next, the median and quantiles are derived as solutions of a minimisation problem of the weighted sum of absolute deviations, in contrast to the basic OLS problem that involves minimising the sum of squared deviations. The basic quantile regression model is introduced gradually: starting with a dummy regressor model, followed by a nominal regressor model, culminating into a quantitative regressor one. This explanation uses several graphs and tabular representations. This is typical for the book and makes the discussions considerably more accessible than is often the case.

This approach is especially useful in Chapters 2 and 3, which illustrate further the characteristics and use of quantile regression by building on the notions introduced in the first chapter. The authors introduce a set of artificial data, simulated using 10 illustrative models sharing the same deterministic structure, but differing in the error term (standard normal, log-normal and skewed, heteroscedastic, autoregressive). Various quantile regression models are then applied to these data, and the estimated coefficients and their inferences are discussed in detail. Here, again the graphical and simulation results provide significant intuitive insight on how the quantile-regression-based inference behaves as a function of the error structure.

While reading the book, however, I had the feeling that this approach might have been taken even further: The explanations of some figures were too brief for my liking. For example, why are the angles of the two curves in Figure 1.10 (page 17) different? The answer is rooted in the explanation later on page 37, but no reference to the earlier figure has been made. As another example, Figure 2.11 has been used to demonstrate that the results of estimating the same quantile regression model for various conditional deciles do not differ much from those based on the whole quantile process. I would have been surprised had it been otherwise; what I would have appreciated much more is a discussion of how these results (be it continuous or discrete) came about in the first place. Finally, in various places in the book, figures containing density and quantile functions are jointly presented, but their relation, clearly obvious to the authors, remain unarticulated. In more than some cases, however, such as for Figures 5.2, 5.3 and 5.9, I would have appreciated a word of explanation, especially because the quantile functions in these figures do not seem to resemble the explained empirical quantile function presented in the first chapter.

As a side issue, some of the graphs in Chapter 2 are printed very light and are therefore difficult to see. This is the case with Figures 2.9, 2.11, 2.12, 2.13 and 2.17. It seems to be a problem of how the graphs in this chapter were produced, rather than how they were printed in the book.

Not all estimation results in this book are based on artificial data. A number of well-chosen examples from various fields such as economics, demographics and medicine are used also, especially in Chapters 4 and 5, which dig deeper in the topics introduced in the first part of the book. These examples give an idea of the potential practical use of quantile regression. Chapter 4 goes deeper into a number of evaluation tools that were introduced in Chapter 3. Beginning with a discussion on transformation, the chapter moves into the issues relating to validation of quantile regression models and inference assessment through bootstrapping. The discussion of various bootstrapping methods is interesting in its own right independent of the issues relating to quantile regression.

Chapter 5 focuses on quantile regression estimators for models with heteroscedastic and dependent errors. Through real-life research examples and data sets, this chapter provides a practical guide to using quantile regression techniques, implementing the inferential methods and interpreting the findings. In an appendix to this chapter and in other appendices to the book as well, the commands needed to implement quantile regression methodology are presented for major statistical softwares such as SAS, R and STATA. This, of course, greatly enhances the practical utility of the book.

The sixth chapter discusses the quantile-regression equivalents of commonly used regression models, including local polynomial regression, censored regression, longitudinal data models and regression models for binary dependent variables. For all the topics that the book covers, the discussion is completed by an empirical example. In line with the philosophy of the book, this provides deeper understanding through the interpretation of the estimation results, and—maybe even more importantly—gives the reader intuition into the applicability. This is unfortunately missing for the binary regression case, which is glossed over in less than three pages without any application or discussion of results.

In short, the arguments in favour of this book are strong: It is accessible and well written, it covers the key elements of quantile regression and provides intuitive insights through the extensive use of graphs, tables and simulated data. Furthermore, the fact that the necessary commands and codes are presented in SAS, R and STATA makes it possible to put the knowledge gained to immediate use. These arguments outweigh the omission of an empirical example of quantile regression for binary dependent variable models and some occasional lack of explanation of the observed findings. All in all, I enjoyed reading this book, and it inspired me to use quantile regression in my own work.

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